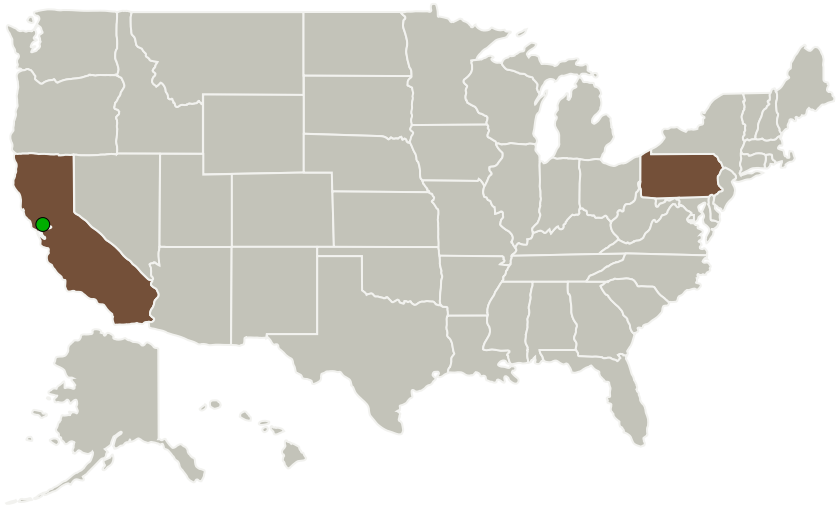
Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase II

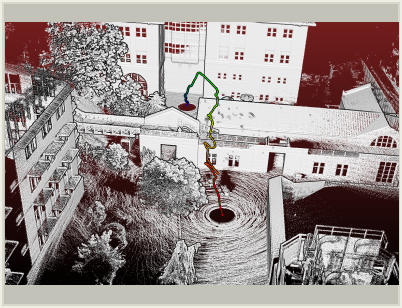
Completed Technology Project (2016 - 2018)

Project Introduction

Unmanned aerial systems (UAS) have the potential to significantly impact modern society. While the technology for unmanned air vehicles operating day in and day out without constant human supervision is maturing steadily, much remains to be done to make these vehicles commonplace. We have identified a number of challenges that must be addressed for these vehicles to safely and efficiently conduct their tasks in the National Airspace System (NAS). Civilian applications of UAS must ensure that they can: (1) fly safely without an operator, using but not relying on maps or GPS to guide their course; and (2) deal with contingencies, especially rare events such as complete failure of sensors that provide awareness of the environment. We plan to address these challenges in the context of small, low-cost air vehicles in a manner that will enable our technology to be widely adopted. In Phase I we have demonstrated GPS-free navigation and environmental mapping in real time on a kilogram-scale sensing and computing payload for a small multi-rotor aircraft. The demonstration was noteworthy because it was conducted in complex environments in which GPS signals are blocked or degraded by multipath. In Phase II we propose to extend GPS-free navigation to a larger set of operating environments and to show collision-free guidance from take-off to landing with emphasis on the phases at low altitudes. We will work with the UTM team at NASA Ames to coordinate our experiments on block 4 testing. We expect to show in this program that it is possible for small autonomous air vehicles to reliably and safely fly in the first and last 50 feet of operation.

Primary U.S. Work Locations and Key Partners





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Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase II

Completed Technology Project (2016 - 2018)

Organizations Performing Work	Role	Type	Location
Near Earth Autonomy, Inc.	Lead Organization	Industry	Pittsburgh, Pennsylvania
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Pennsylvania

Project Transitions

May 2016: Project Start

May 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139644)*

Images

Briefing Chart Image
Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase II
(https://techport.nasa.gov/image/131157)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Near Earth Autonomy, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Sanjiv Singh

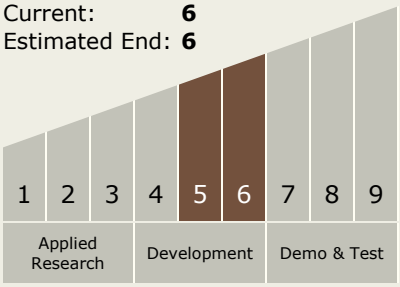
Co-Investigator:
Sanjiv Singh

Autonomous, Safe Take-Off and Landing Operations for Unmanned Aerial Vehicles in the National Airspace, Phase II

Completed Technology Project (2016 - 2018)

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.4 Architectures and Infrastructure

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System